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OF

NATURAL PHILOSOPHY, CHEMISTRY,

AND

THE ARTS:

Giving an Account of the Present State, New Publications,
and Discoveries in those Sciences, and the various
Departments of Manufacturing Industry.

ILLUSTRATED WITH ENGRAVINGS.

BY WILLIAM NICHOLSON.

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by whom Communications and Orders are received.

THE Work will be printed in Quarto, with a new Letter, upon
good Paper; each Number containing Six Sheets of Letter-press,
and two or more Plates.

The Journal for each year will consequently make one handsome
Volume of near six hundred pages.

WHILE Journals of Literature, of Science, and of the Arts,
have from time to time appeared upon the Continent under the
direction of men of character and ability, it is remarkable that
most of the Periodical Publications of this country have been
brought forward without the name either of Author or Editor.
Whether this conduct may have arisen from a wish to treat more
freely of passing events, where the responsibility of the Writer is
evidently less, or from whatever other causes it may have originat-
ed, are questions which might afford matter for interesting discus-
sion, if the present occasion demanded an attention to that object.
The Proposer of the Journal, now offered to the world, does not
think that any sufficient reasons have ever existed to discourage a
practice so respectable for its candour and justice as that of an
Author speaking of Men and Things in his own name and person.
He believes, on the contrary, that such a practice is calculated to
inspire confidence; that it affords a strong motive to correctness
and

and fidelity, and renders a work deserving, at least in these respects, of being quoted by other Authors of credit. It is an obvious fact, that this obscurity, and its inevitable consequences, have prevented men of reputation from corresponding openly with the Managers of our Periodical Publications, as is the uniform practice with regard to the Foreign Journals; and he is encouraged to expect, from the removal of this obstacle, as well as from other inducements, that his endeavours for the promotion of knowledge will not be without this valuable assistance. Under these convictions he has determined to make the experiment. To what degree his exertions may become useful, or meet with the public approbation, must ultimately depend on the actual execution of the plan he has formed and digested. The world is in some measure informed, that he has passed his life in the earnest cultivation of science; and various events have enabled him to acquire considerable practical experience in the Arts and Manufactures. If it could be imagined, that he, who proposes to convey information to others, ought first to bring his own knowledge to a state of absolute perfection; or, if an attempt to collect and arrange the labours of ingenious men in every branch of Natural Philosophy and its dependancies, could be thought to imply any such absurd pretension, some apology might be necessary for the individual who stands forward in so marked a situation. But inferences like these can never be maintained. The Author will doubtless receive much instruction, while he is the instrument of conveying it to others; and he reflects with satisfaction, that he can recur to many estimable friends, and other sources of information, in departments to which his own pursuits may have been less immediately directed. Dismissing, therefore, at once, every farther consideration that may relate to himself, he will proceed to give an outline of the plan of his Work, and the objects upon which it is to be employed.

CONTENTS OF THE WORK.

THE Work will contain original Accounts of the Present State of the Sciences and Arts, and of Books published relating to them. The accounts of New Discoveries, collected by observation, enquiry, and correspondence, as well as from the Acts of Academies, the Chancery Registers, and Publications in all languages, will be either given entire, with such remarks and collateral facts as present themselves, or they will be more or less abridged according to their relative importance. The most minute attention will be paid to accuracy, more especially with regard to the sources of communication, which will be distinctly pointed out, in every instance, except in the single case of anonymous correspondence.

In order to shew, more particularly, the objects upon which this Journal will be employed, it will be useful to give a rapid sketch, in the order of Analysis, of the several divisions of philosophical science, and the arts dependant upon them. By this means the man of science, as well as the intelligent manufacturer, will more clearly perceive how eminently useful a work of this nature must be to their respective pursuits.

I. NATURAL HISTORY. This science teaches us to distinguish the objects around us, by accurate classification and arrangement. It is the repository of facts which

which constitute the ground-work of every practical science or art. For, if we were unable to distinguish the individuals of the several species of being, it is clear, that general inferences, and mutual communication, would be alike impossible to be made.

II. MECHANICS. Perceptible motion is the object of this branch of Natural Philosophy. The simplest cases, being first to be considered, lead us to those organs called the Mechanical Powers. Hence are derived the theory and effects of all kinds of tools, instruments, engines, mills, carriages, and the like. Hydrostatics constitute a branch of this science, which is employed on the mechanical effects of fluids, independant of their elasticity. The praxis is seen in the flow of rivers and streams, the construction of canals, fountains, reservoirs, water-mills, &c. When the elasticity of fluids is brought into the consideration, the term *pneumatics* is used. The motions, pressure, and vibrations of the air, or other elastic matter, afford numerous instances of effects of this nature. These are seen in the air-pump, the barometer, wind-mills, steam-engines, artillery, instruments for producing and modifying sound, &c.

A very great number of particular instruments in Natural Philosophy and Manufactures, belong to this department.

III. THE DOCTRINE OF HEAT. The effects of this great agent stand alone among natural phenomena. The laws of its communication, the capacities of bodies, and the changes of temperature they undergo, when their state with regard to solidity, fluidity, elasticity, or chemical composition, is altered, constitute a beautiful theory, in a great measure invented, and almost entirely arranged, by our cotemporaries. The application of the practical results to economical purposes, is of extensive utility. The warming of apartments, the preparation of food, the operations of chemistry, and numberless processes of manufacture, are absolutely dependant upon it.

IV. GENERAL OPTICS. The universal properties of light present themselves under this head. Such are its density, progression, velocity, inflection, reflection, refraction, and colour. Particular applications of Optics are seen in the mixed mathematical science of Perspective, and the extension of the powers of sight, by lenses, mirrors, their combinations in telescopes, microscopes, &c. with their various improvements.

V. ELECTRICITY. The class of phenomena, called *electric*, are capable of arrangement under general laws; but how far heat, light, or other peculiar substances, or the composition or decomposition of bodies may be concerned in their production, or modification, is scarcely at all known. Much remains yet to be ascertained, with regard to its atmospherical, economical, medical, or other uses or effects.

VI. CHEMISTRY. The Natural History of the animal, vegetable, and mineral kingdoms, is confined, by the chemist, chiefly to such facts as tend to indicate the component parts of the respective individuals. All the operations of this art are referable to the theory of elective attractions. The operations of Philosophical Chemistry are directed to the perfection of the theory, by general results. They are made by means of vessels, furnaces, and other instruments; either in the humid, the dry, or the pneumatic method, but most frequently by combination of all three. Economical Chemistry is the art of obtaining products for general use in society. It more particularly directs our attention to the Histories of the Chemical Arts. These constitute so very large a part of the industry of man, that they cannot be here enumerated. The extraction and purification of saline bodies; the amendment and perfection of agricultural processes; the manufactures of bricks, pottery, cements, and glasses; the melioration of fuels; the production and improvement of oils, candles, gunpowder, and other inflammable bodies; the working of mines and metals; the arts of analysis and assay; the application of colouring matters in painting and dyeing; the art of tanning; the preparation of malt, beer, wine, ardent spirit, vinegar; the making of starch, bread, sugar, and the preservation of animal and vegetable foods, are instances sufficient to shew the extended use and influence of Chemistry, in the enjoyments of civilized life.

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The science of Chemistry is applied to investigate the changes to which the face of the globe has been subjected in past ages, or to which it may hereafter be exposed, in the arrangement and structure of its component parts.

Pneumatic Chemistry is combined with Statics in accounting for the phenomena and uses of the atmosphere. Meteorology may thus become a regular science, founded on just principles of induction. The density, temperature, humidity, and electricity, of the air, are shewn by suitable instruments. Its salubrity, as far as relates to the maintenance of processes analogous to combustion, is shewn by the eudiometer. Its component parts are ascertained by strict chemical processes. From these and other facts, the causes and variations of winds, the absorption and precipitation of moisture, in hail, snow, or rain; the accumulation of lightning, and the effects of local circumstances of the country upon the weather, as well as the influence of the whole upon animated beings, may hereafter be more accurately determined than has yet been done.

VII. MENSURATION. The objects of natural history, practical mechanics, and chemistry, are for the most part in the vicinity of the observer: but the investigations of the Philosopher are also extended to remote objects. In these it is of importance to ascertain their figure, distance, and relative position. The first comes within the province of Optics; the latter are determined by the application of mathematical principles to instruments for the admeasurement of lines and angles. The construction of standard instruments, for measuring right lines, of divided arcs for measuring angles, and of clocks for marking the flow of time, afford instances, in which the abstract doctrines of quantity, the physical knowledge of the properties of the materials, and the mechanical expedients for securing a great degree of accuracy, are so happily united as to reflect much honour upon the Philosophers and Artists of the present age.

The chief practical sciences established upon the measurement of lines and angles, are astronomy, geography, navigation, and surveying.

VIII. UNIVERSAL GEOGRAPHY. This science comprehends every discussion relating to the face of the earth. These are, the limits, figure, and other peculiarities of countries and places; the origin and present state of different nations; their habitations, manners, produce, industry, arts, commerce, public regulations, and facilities for mutual intercourse, by roads, canals, rivers, or the sea. Objects of this description lead to details of the highest utility. There are few questions of political economy which may not be experimentally solved by reference to the actual practice of society, in some country, either at the present, or in times past.

IX. ASTRONOMY. The number, distance, situation, figure, motions, and other affections of the heavenly bodies, belong to this department. Practical astronomy consists in observing these particulars, by means of optical and mathematical apparatus. The results with regard to the past or future time, are registered in Almanacs or Ephemerides. They may be obtained by computation, either from the great mass of observations immediately considered, or from the theory of gravitation, which constitutes physical astronomy. The phenomena which fall most directly under the observation of the multitude, are eclipses, tides, the change of seasons, varying length of days, &c. Geography and Navigation are greatly dependant upon Astronomy.

X. ABSTRACT PHYSICS. In every process of reasoning we endeavour to obtain general truths. This cannot be done, but by abstracting, or rejecting from our consideration, all those circumstances which mark the individuality of the things we contemplate. In the last steps of reasoning concerning the universe, the abstraction is carried to such an extent, that properties, or modes of existence, are treated independantly of the beings on which in strictness they depend. These are, space, duration, extension, motion, penetrability, attraction, repulsion, impulse, force, inertia. A considerable portion of the errors of Theorists has arisen from the imperfect logic they have used respecting these abstract notions.

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